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MATHEMATICS

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From 2014 to 2024

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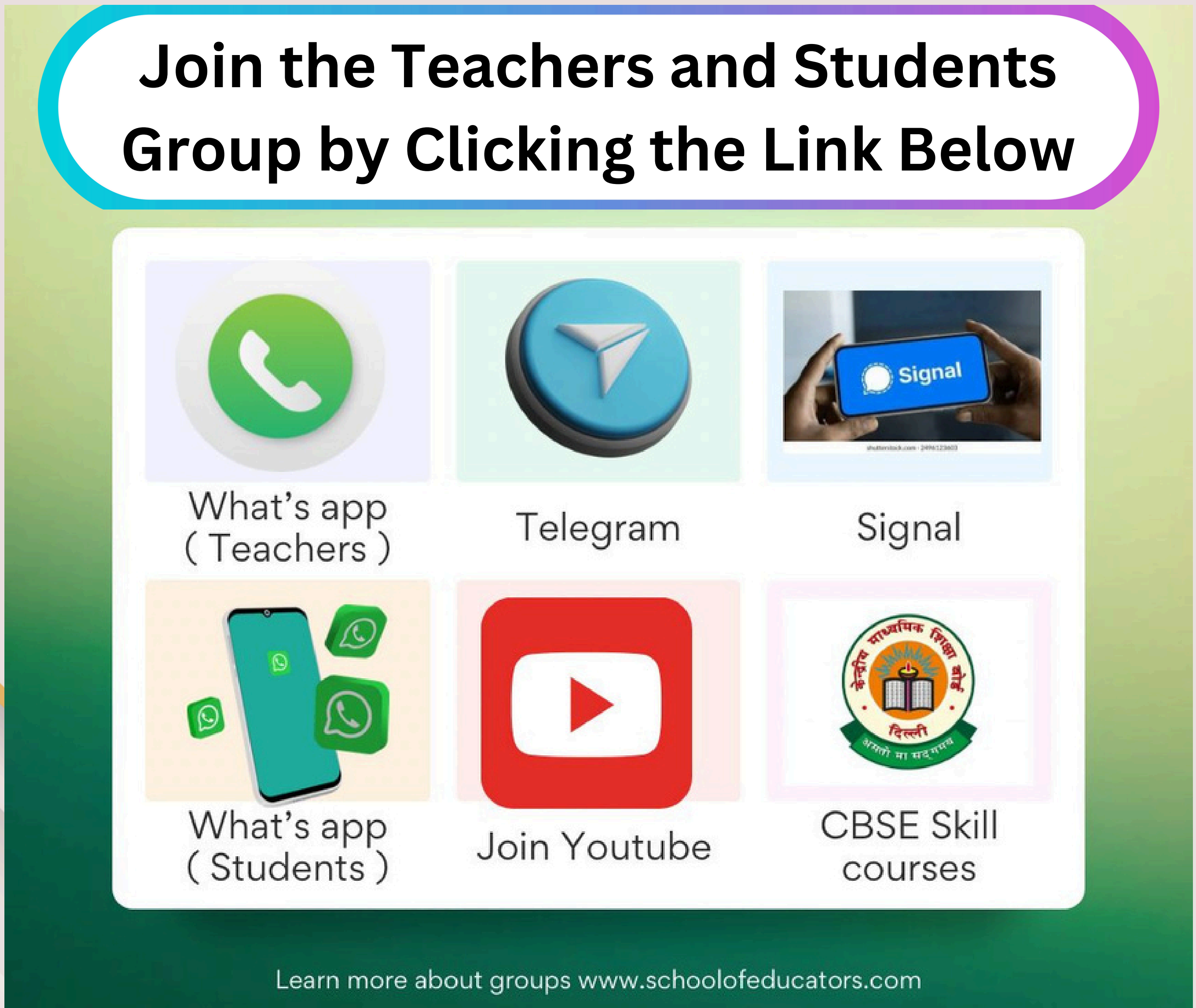


Class 10 Mathematics
Previous Year Questions
Chapter-2 : Polynomials

2.1 Introduction

MCQ:

1. **If one of the zeroes of a quadratic polynomial $(k-1)^2 + kx + 1$ is -3, then the value of k is**

   a) 4/3
   b) -4
   c) 3
   d) 2/3 (NCERT Exemplar, Term I, 2021-22)

2. **The degree of polynomial having zeroes -3 and 4 only is**

   a) 2
   b) 1
   c) more than 3
   d) 3 (2020)

3. **If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is**

   a) 10
   b) -10
   c) -7
   d) -2 (2020)

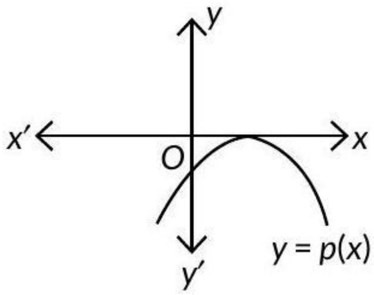
4. **The zeroes of the polynomial $3x^2 + 11x - 4$ are:**

   a) 1/3,4
   b) -1/3
   c) 1/3,-4
   d) -1/3,4 (2024)

2.2 Geometrical Meaning of the Zeroes of a Polynomial

MCQ:

5. **The graph of y= p(x) is given, for a polynomial p(x). The number of zeroes of p(x) from the graph is**



a) 3
b) 1
c) 2
d) 0

(2023)

2.3 Relationship between Zeroes and Coefficients of a Polynomial

MCQ:

6. Which of the following is a quadratic polynomial with zeroes $\frac{5}{3}$ and 0 ?

a) 3x(3x-5)
b) 3x(x-5)
c) $x^2 - \frac{5}{3}$
d) $\frac{5}{3}x^2$

(2023)

7. If α, β are the zeroes of a polynomial p(x) = $x^2 + x - 1$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ equals to

a) 1
b) 2
c) -1
d) −1

(2023)

8. **If α, β, are zeroes of the polynomial $x^2 - 1$, then value of (α + β) is**

a) 2
b) 1
c) -1
d) 0

(2023)

9. **If α, β are the zeroes of the polynomial p(x) = $4x^2$ – 3x -7, then $\left(\frac{1}{\alpha}+\frac{1}{\beta}\right)$ is equal to**

a) $\frac{7}{3}$
b) $\frac{-7}{3}$
c) $\frac{3}{7}$
d) $\frac{-3}{7}$

(2023)

10. **A quadratic polynomial, the sum of whose zeroes is −5 and their product is 6, is**

a) x^2+5x+6
b) x^2-5x+6
c) x^2-5x-6
d) -x^2+5x+6

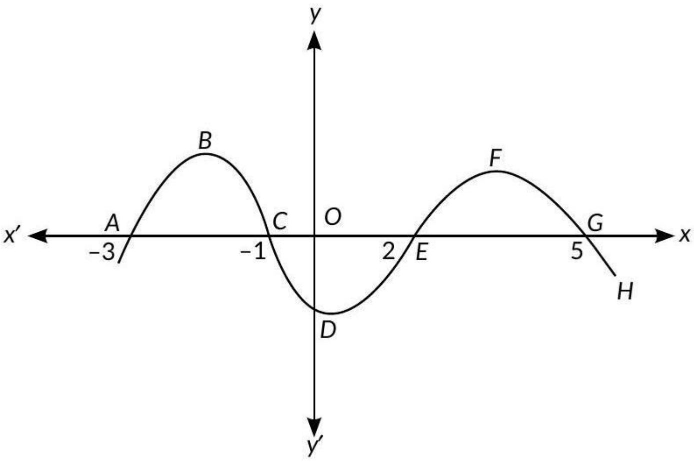
(2024)

11. **For what value of k, the product of zeroes of the polynomial $kx^2 - 4x - 7$ is 2?**

a) 1/14
b) 7/2
c) 7/2
d) 2/7

(2024)

Case study: A car moves on a highway. The path it traces is given below:



Based on the above information, attempt any 4 questions from 9 to 13.

12. What is the shape of the curve EFG?

a) Parabola
b) Ellipse
c) Straight line
d) Circle

(Term I, 2021-22)

13. If the curve ABC is represented by the polynomial $-(x^2 + 4x + 3)$, then its zeroes are

a) 1 and -3
b) -1 and 3
c) 1 and 3
d) -1 and -3

(Term I, 2021-22)

14. If the path traced by the car has zeroes at -1 and 2, then it is given by

a) x^2+x+2
b) x^2-x+2
c) x^2-x-2
d) x^2+x-2

(Term I, 2021-22)

15. The number of zeroes of the polynomial representing the whole curve, is

a) 4
b) 3
c) 2
d) 1

(Term I, 2021-22)

16. The distance between C and G is

a) 4 units
b) 6 units
c) 8 units
d) 7 units

(Term I, 2021-22)

17. The quadratic polynomial, the sum of whose zeroes is -5 and their product is 6, is

a) x^2 + 5x + 6
b) x^2 - 5x + 6
c) x^2 - 5x -6
d) $-x^2$ + 5x + 6

(Term I, 2021-22, 2020)

VSA (1 mark)

18. . If α,β are the zeroes of the quadratic polynomial f(x) = $x^2 - x - 4$, find the value of $\frac{1}{\alpha}+\frac{1}{\beta}-\alpha\beta$

(2021C)

19. If one zero of the quadratic polynomial f(x) = x^2 +3x + k is 2, then find the value of k .

(2021C)

20. If α, β are zeroes of the polynomial $2x^2 - 5x - 4$, then $\frac{1}{\alpha}+\frac{1}{\beta}$=

(2020C)

21. If α, β are zeroes of the polynomial $-3x^2 + x - 5$, then $\frac{1}{\alpha}+\frac{1}{\beta}$=

(2020C)

22. Form a quadratic polynomial, the sum and product of whose zeroes are -3 and 2 respectively.

(2020)

23. Find the quadratic polynomial whose zeroes are 3 and -4 respectively.

(Board Term I, 2015) ,

24. (a) If α, β are zeroes of the polynomial $8x^2 + 14x + 3$then find the value of $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$.

OR

(b) Find a quadratic polynomial whose zeroes are -9 and 6.

Is there anything else you need help with?

(2024)

SA I (2 marks)

25. If one zero of the polynomial $p(x) = 6x^2 + 37x - (k - 2)$ is reciprocal of the other, then find the value of k.

(2023)

26. If α and β are zeroes of the polynomial $x^2 - p(x + 1) + c$ such that $(\alpha + 1)(\beta + 1) = 0$, then find the value of c.

(Board Term I, 2016)

27. If α and β are zeroes of $4x^2 + 3x + 7$, then find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$.

(Board Term I, 2015)

SA II (3 marks)

28. Find a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $f(x) = ax^2 + bx + c, a \neq 0, c \neq 0$.

(2020)

29. Find the value of k such that the polynomial $x^2 - (k + 6)x + 2(2k - 1)$ has sum of its zeroes equal to half of their product.

(Delhi 2019)

30. Find the zeroes of the quadratic polynomial $7y^2 - \frac{11}{3}y - \frac{2}{3}$ and verify the relationship between the zeroes and the coefficients.

(2019)

31. Find the quadratic polynomial, sum and product of whose zeroes are -1 and -20 respectively. Also, find the zeroes of the polynomial so obtained.

32. If α and β are zeroes of $4x^2 - x - 4$, find quadratic polynomial whose zeroes are $\frac{1}{2\alpha}$ and $\frac{1}{2\beta}$.

(Board Term I, 2017)

33. If α and β are the zeroes of $p(x) = 6x^2 - 7x + 2$. Find the quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ & $\frac{1}{\beta}$.

(Board Term I, 2017)

34. Find the zeroes of quadratic polynomial $6x^2 - 3 - 7x$ and verify the relationship between the zeroes and the coefficients of the polynomial.

(Board Term I, 2015)

35. (a) Zeroes of the quadratic polynomial $x^2 - 3x + 2$ are α and β. Construct a quadratic polynomial whose zeroes are $2\alpha + 1$ and $2\beta + 1$.

(b)

Find the zeroes of the polynomial $4x^2 - 4x + 1$ and verify the relationship between the zeroes and the coefficients. (2024)

36. Find the zeroes of the quadratic polynomial $5x^2 + 3x - 2$ and verify the relationship between the zeroes and the coefficients. (2024)

Class 10 Mathematics

PYQ Solutions

Chapter-2 : Polynomials

1. (a): Given, -3 is a zero of quadratic polynomial $(k-1)x^2+kx+1$.

   $\therefore\ (k-1)(-3)^2+k(-3)+1=0$

   $\Rightarrow 9\text{k}-9-3\text{k}+1=0 \Rightarrow 6\text{k}-8=0$

   $\Rightarrow k=8/6 \Rightarrow k=\dfrac{4}{3}$

2. (a): Since, the polynomial has two zeroes only. So, the degree of the polynomial is 2.

   Note

   The degree of the polynomial is the highest power of the variable in a polynomial equation.

3. (b) : Given, 2 is a zero of the polynomial $p(x)=x^2+3x+k$

   $\therefore\ p(2)=0 \Rightarrow (2)^2+3(2)+k=0 \Rightarrow 4+6+k=0$

   $\Rightarrow 10+k=0 \Rightarrow k=-10$

4. (C) $\frac{1}{3}, -4$ (2024)

5. (b):

   Here, $y=p(x)$ touches the x-axis at one point.

   So, number of zeros is one.

6. (a): Consider option (a)

   $3x(3x-5)=0$

   $\Rightarrow 3x=0$ or $3x-5=0 \Rightarrow x=0$ or $x=\frac{5}{3}$

7. (a): We have, $p(x)=x^2+x-1, \alpha+\beta=-1$

   and $\alpha\cdot\beta=-1$

   Now, $\frac{1}{\alpha}+\frac{1}{\beta}=\frac{\alpha+\beta}{\alpha\beta}=\frac{-1}{-1}=1$

8. (d): Since, α,β are the zeroes of polynomial x^2-1

   $\therefore\ x^2+0x-1=0$

   $\therefore$ Sum of zeroes, $(\alpha+\beta)=0$

9. (d): Since, α,β are the zeroes of polynomial $p(x)=4x^2-3x-7$

   $\therefore$ Sum of zeroes, $(\alpha+\beta)=\frac{3}{4}$

   and product of zeroes $(\alpha\beta)=\frac{-7}{4}$

   Now, $\frac{1}{\alpha}+\frac{1}{\beta}=\frac{\alpha+\beta}{\alpha\beta}=\frac{\frac{3}{4}}{\frac{-7}{4}}=\frac{-3}{7}$

10. (a) $x^2 + 5x + 6$ (2024)

11. (a): Shape of curve EFG is parabola.

12. (b) $\frac{7}{2}$ (2024)

13. (d): Given polynomial is $-(x^2 + 4x + 3)$.

Corresponding equation is $x^2 + 4x + 3 = 0$

$\Rightarrow x^2 + x + 3x + 3 = 0 \Rightarrow (x+1)(x+3) = 0$

$\Rightarrow x = -1, -3$

14. (c): The polynomial having zeroes α, β is $k[x^2 - (\alpha+\beta)x + \alpha\beta]$, where k is real.

Here $\alpha = -1$ and $\beta = 2$

$\therefore$ Required polynomial $= k[x^2 - (-1+2)x + (-1) \times (2)]$

$= [x^2 - x - 2]$ (for $k = 1$)

15. (a): Given curve cuts the x-axis at four distinct points. So, number of zeroes will be 4.

16. (b): The distance between point C and G is 6 units.

17. (a) : Let α, β be the zeroes of required polynomial $p(x)$. Given, $\alpha + \beta = -5$ and $\alpha\beta = 6$

$\therefore p(x) = k[x^2 - (-5)x + 6] = k[x^2 + 5x + 6]$

Thus, one of the polynomial which satisfy the given condition is $x^2 + 5x + 6$

18. Given, α and β are the zeros of the polynomial

$f(x) = x^2 - x - 4$

$\therefore$ $\alpha + \beta = 1$ and $\alpha\beta = -4$

Now, $\frac{1}{\alpha} + \frac{1}{\beta} - \alpha\beta = \frac{\alpha+\beta}{\alpha\beta} - \alpha\beta = \frac{1}{-4} - (-4) = \frac{-1}{4} + 4 = \frac{15}{4}$

19. Given, polynomial is $f(x) = x^2 + 3x + k$

Since, 2 is zero of the polynomial $f(x)$.

$\therefore f(2) = 0$

Quadratic polynomial is : k $(x^2 + 3x - 54)$ or $x^2 + 3x - 54$

$\Rightarrow f(2) = (2)^2 + 3 \times 2 + k \Rightarrow 4 + 6 + k = 0 \Rightarrow k = -10$

20. Given, α and β are zeros of $2x^2 - 5x - 4$

$\therefore$ $\alpha + \beta = 5/2$ and $\alpha\beta = -2$

Now, $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{5/2}{-2} = -5/4$

21. Given, α and β are zeros of $-3x^2 + x - 5$

$\therefore$ $\alpha + \beta = 1/3$ and $\alpha\beta = 5/3$

Now, $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{1/3}{5/3} = 1/5$

22. Let α, β be the zeroes of required polynomial $p(x)$.

Given, $\alpha+\beta=-3$ and $\alpha\beta=2$

$\therefore\ p(x)=k[x^2-(-3)x+2]=k[x^2+3x+2]$

For $k=1, p(x)=x^2+3x+2$

Hence, one of the polynomial which satisfy the given condition is x^2+3x+2

23. We have, 3 and -4 are the zeroes of quadratic polynomial. Now, sum of zeroes $=3+(-4)=-1$

Product of zeroes $=3(-4)=-12$

$\therefore$ Required quadratic polynomial is

$k[x^2-$ (sum of zeroes) $x+$ product of zeroes]

$=k[x^2-(-1)x+(-12)]=x^2+x-12$

(for $k=1$)

24 (a)As β ,α are zeroes of the polynomial

$$\therefore\ \alpha+\beta=\frac{-14}{8}$$

$$\alpha\beta=\frac{3}{8}$$

$$\frac{1}{\alpha}+\frac{1}{\beta}=\frac{\beta+\alpha}{\alpha\beta}=\frac{-14}{3}$$

OR

(b) Sum of zeroes $=-3$

Product of zeroes $=-54$

Quadratic polynomial is : $k(x^2+3x-54)$ or $x^2+3x-54$

(2024)

25. Let one zero of the polynomial $p(x)$ be α, then the other zero be $1/\alpha$.

For zeroes of polynomial $p(x)=6x^2+37x-(k-2)$

$\therefore$ Product of zeroes $=\alpha\times\frac{1}{\alpha}=\frac{-(k-2)}{6}$

$$\Rightarrow\ \frac{-(k-2)}{6}=1$$

$\Rightarrow k-2=-6\Rightarrow k=-4$

26. The given polynomial is $x^2 - p(x+1) + c$

If α and β are zeroes of given polynomial

$\therefore$ Sum of zeroes $= \alpha + \beta = -\frac{b}{a} = \frac{-(-p)}{1} = p$

and product of zeroes $= \alpha\beta = \frac{-p+c}{1} = -p + c$

Now, $(\alpha + 1)(\beta + 1) = 0$

$\Rightarrow \alpha\beta + \alpha + \beta + 1 = 0$

$\Rightarrow -p + c + p + 1 = 0 \Rightarrow c + 1 = 0 \therefore c = -1$

Note

If α and β are zeroes of quadratic polynomial $p(x) = ax^2 + bx + c$, then $\alpha + \beta = \frac{-b}{}, \alpha\beta = \frac{c}{a}$

27. Given, α and β are zeroes of $4x^2 + 3x + 7$

$\therefore \alpha + \beta = -\frac{3}{4}$ and $\alpha\beta = \frac{7}{4}$

Now, $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{\frac{-3}{4}}{\frac{7}{4}} = \frac{-3}{7}$

28. Let α, β are the zeroes of the polynomial $ax^2 + bx + c$.

$\therefore$ $\alpha + \beta = \frac{-b}{a}$ and $\alpha\beta = \frac{c}{a}$

Now we have to find quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

Now, $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{-b/a}{c/a} = \frac{-b}{c}$ and $\left(\frac{1}{\alpha}\right)\left(\frac{1}{\beta}\right) = \frac{1}{\alpha\beta} = \frac{1}{c/a} = \frac{a}{c}$

Thus, the required polynomial is

$$p(x) = k\left(x^2 - \left(-\frac{b}{c}\right)x + \frac{a}{c}\right) = \frac{k}{c}(cx^2 + bx + a)$$

For $k = c, p(x) = cx^2 + bx + a$

Note

A quadratic polynomial is a second-degree polynomial, where the value of the highest degree is equal to 2.

29. The given polynomial is $f(x) = x^2 - (k+6)x + 2(2k-1)$ Now, sum of zeroes $= \frac{k+6}{1}$ and product of zeroes

$$= \frac{2(2k-1)}{1}$$

According to question,

Sum of zeroes $= \frac{1}{2}$ (Product of zeroes) $\Rightarrow k + 6 = \frac{1}{2} \times 2(2k-1)$

$\Rightarrow k + 6 = 2k - 1 \Rightarrow k = 7$

30. Let $f(y) = 7y^2 - \frac{11}{3}$ $_{3}$ $_{3}$

$\Rightarrow f(y) = \dfrac{(3y-2)(7y+1)}{3}$

Zeros of polynomial is given by $f(y) = 0$

$\Rightarrow (3y-2)(7y+1) = 0 \Rightarrow$ Either $y = \frac{2}{3}$ or $y = \frac{-1}{7}$

Hence, $\frac{-1}{7}$ and $\frac{2}{3}$ are zeros of $f(y)$.

$\therefore$ Sum of zeros $\frac{-1}{7} + \frac{2}{3} = \frac{-3+14}{21} = \frac{11}{21}$

$= -\dfrac{(\text{ Coefficient of } y)}{(\text{ Coefficient of } y^2)}$

and product of zeros $= \left(\frac{-1}{7}\right)\left(\frac{2}{3}\right) = \frac{-2}{21} = \frac{\text{Constant term}}{\text{Coefficient of } y}$

Hence, the relationship between zeros and coefficients of the polynomial is verified.

31. Let the zeros of the quadratic polynomial be α and β.

Given, $\alpha + \beta = -1$ and $\alpha \cdot \beta = -20$

Then, the quadratic polynomial will be

$$f(x) = x^2 - (\alpha + \beta)x + \alpha \cdot \beta$$

$\Rightarrow f(x) = x^2 - (-1)x + (-20) \Rightarrow f(x) = x^2 + x - 20$

To find the zeros of the polynomial, we put $f(x) = 0$

$\Rightarrow x^2 + x - 20 = 0 \Rightarrow x^2 + 5x - 4x - 20 = 0$

$\Rightarrow x(x+5) - 4(x+5) = 0 \Rightarrow x = 4, -5$

$\therefore$ $x = 4$ and -5 are the zero of the polynomial so obtained.

32. Given, α and β are the zeroes of the polynomial $4x^2 - x - 4$

$\therefore\ \alpha + \beta = \frac{1}{4}$ and $\alpha\beta = \frac{-4}{4} = -1$

Let S and P denote respectively the sum and product of the zeroes of the polynomial whose zeroes are $\frac{1}{2\alpha}$ and $\frac{1}{2\beta}$.

Then, $S = \frac{1}{2\alpha} + \frac{1}{2\beta} = \frac{\alpha+\beta}{2\alpha\beta} = \frac{\frac{1}{4}}{2(-1)} = \frac{-1}{8}$

$$P = \left(\frac{1}{2\alpha}\right)\left(\frac{1}{2\beta}\right) = \frac{1}{4\alpha\beta} = \frac{1}{4(-1)} = \frac{-1}{4}$$

Thus, the required polynomial is $k(x^2 - Sx + P)$

$$= k\left(x^2 - \left(-\frac{1}{8}\right)x + \left(-\frac{1}{4}\right)\right)$$

$= 8x^2 + x - 2$

(for $k = 8$)

33. Given, α and β are the zeroes of the polynomial $6x^2 - 7x + 2$

$\therefore\ \alpha + \beta = \frac{7}{6}$ and $\alpha\beta = \frac{2}{6} = \frac{1}{3}$

Now, we have to find quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

Now, $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{\frac{7}{6}}{\frac{1}{3}} = \frac{7}{2}$ and $\left(\frac{1}{\alpha}\right)\left(\frac{1}{\beta}\right) = \frac{1}{\alpha\beta} = \frac{1}{\frac{1}{3}} = 3$

Thus, the required polynomial is

$$p(x) = k\left(x^2 - \frac{7}{2}x + 3\right)$$

For $k = 2, p(x) = 2x^2 - 7x + 6$.

34. Let $f(x) = 6x^2 - 3 - 7x$ or $6x^2 - 7x - 3$

$= 6x^2 - 9x + 2x - 3 = (3x + 1)(2x - 3)$

Zeroes of polynomial is given by $f(x) = 0$

$\Rightarrow (3x + 1)(2x - 3) = 0 \Rightarrow$ either $x = -\frac{1}{3}$ or $x = \frac{3}{2}$

Hence, $-\frac{1}{3}$ and $\frac{3}{2}$ are zeroes of $f(x)$.

$\therefore$ Sum of zeroes $= -\frac{1}{3} + \frac{3}{2} = \frac{-2+9}{6} = \frac{7}{6}$

$$= \frac{-(\text{ Coefficient of } x)}{(\text{ Coefficient of } x^2)}$$

and product of zeroes $= \left(-\frac{1}{3}\right)\left(\frac{3}{2}\right) = \frac{-3}{6} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$

Hence, the relationship between zeroes and coefficients of the polynomial is verified.

35. **Solution:** (a) $p(x) = x^2 - 3x + 2$

α, β are its zeroes

$\therefore \alpha + \beta = \frac{-b}{a} = 3$

$\alpha\beta = 2$

Required sum of zeroes $= (2\alpha+1) + (2\beta+1) = 2(\alpha + \beta) + 2 = 8$

Required product of zeroes $= (2\alpha+1)(2\beta+1) = 4\alpha\beta + 2(\alpha + \beta) + 1$

$= 4 \times 2 + 2 \times 3 + 1 = 15$

Required quadratic polynomial is $k(x^2 - 8x + 15)$ or $x^2 - 8x + 15$

OR

(b) $p(x) = 4x^2 - 4x + 1 = (2x - 1)(2x - 1)$

$\therefore$ Zeroes are $\frac{1}{2}$ and $\frac{1}{2}$

Sum of zeroes $= \frac{1}{2} + \frac{1}{2} = 1 = \frac{-(-4)}{(4)} = \frac{-Coeff.\ of\ x}{Coeff.\ of\ x^2}$

Product of zeroes $= \left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1}{4} = \frac{Constant\ term}{Coeff.\ of\ x^2}$ (2024)

36. **Solution:** $5x^2 + 3x - 2 = (5x - 2)(x + 1) \Rightarrow x = -1, \frac{2}{5}$

Sum of the zeroes $= -1 + \frac{2}{5} = \frac{-3}{5} = \frac{-(Coeff.\ of\ x)}{Coeff.\ of\ x^2}$

Product of the zeroes $= -1 \times \frac{2}{5} = \frac{-2}{5} = \frac{\text{Constant term}}{\text{Coeff. of } x^2}$ (2024)

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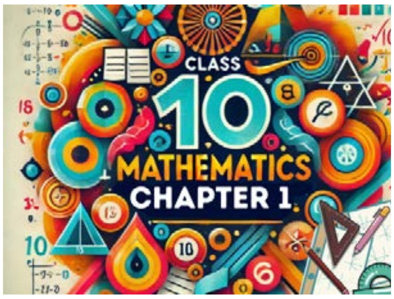

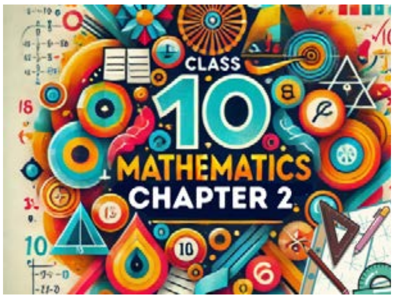

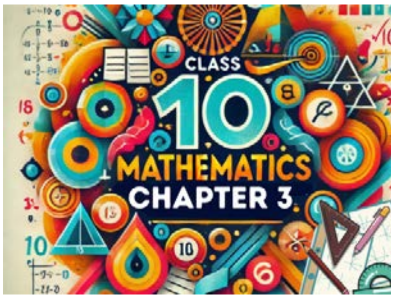

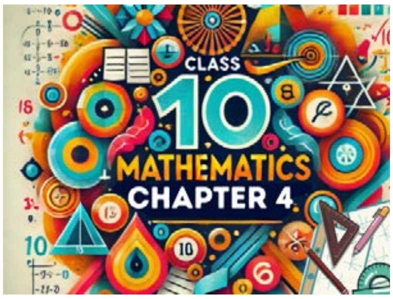

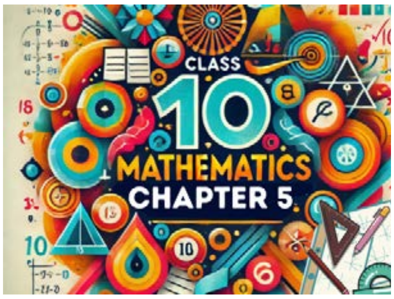

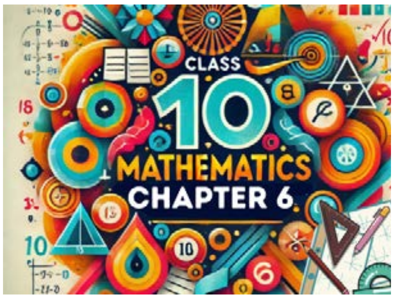

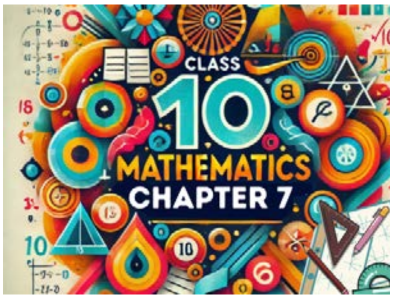

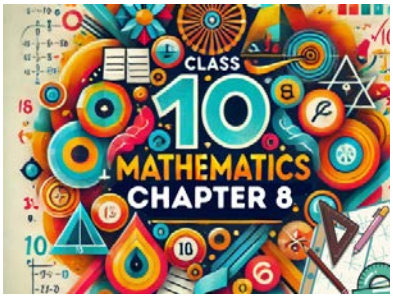

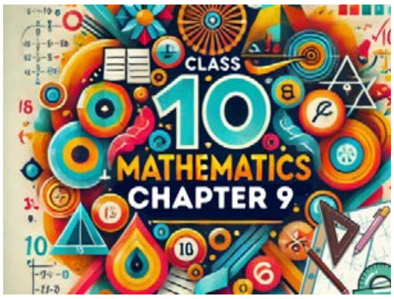

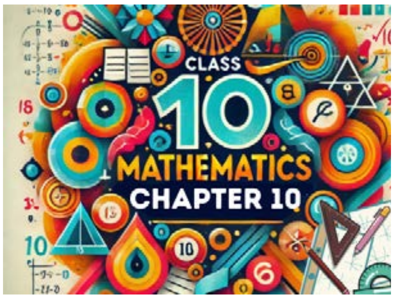

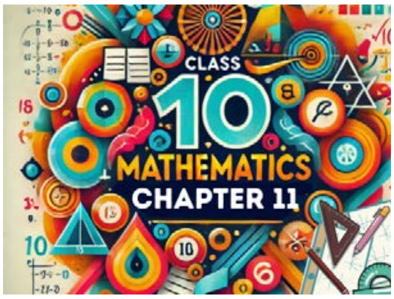

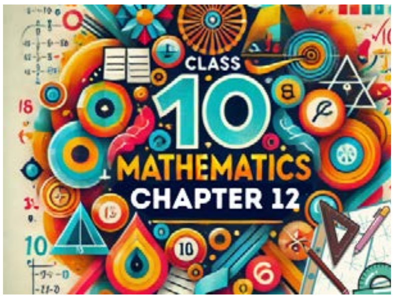

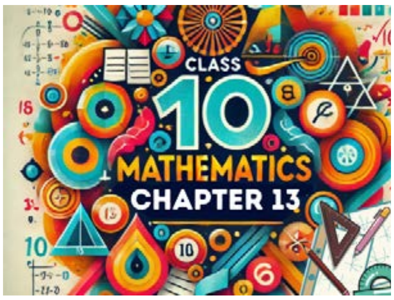

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